

## A X I O M S.

A X. I.

**T**HE Angles of Incidence, Reflexion, and Refraction, lye in one and the same Plane.

A X. II.

The Angle of Reflexion is equal to the Angle of Incidence.

A X. III.

If the refracted Ray be returned directly back to the Point of Incidence, it shall be refracted into the Line before described by the incident Ray.

A X. IV.

Refraction out of the rarer Medium into the denser, is made towards the Perpendicular; that is, so that the Angle of Refraction be less than the Angle of Incidence.

A X. V.

The Sine of Incidence, is either accurately or very nearly in a given Ratio to the Sine of Refraction.

Whence if that Proportion be known in any one Inclination of the incident Ray, 'tis known in all the Inclinations, and thereby the Refraction in all cases of Incidence on the same refracting Body may be determined. Thus if the Refraction be made out of Air into Water, the Sine of Incidence of the red Light is to the Sine of its Refraction as 4 to 3. If out of Air into Glass, the Sines are

as

as 17 to 11. In Light of other Colours the Sines have other Proportions: but the difference is so little that it need seldom be considered.

Suppose therefore, that R S represents the Surface of Fig. 1. stagnating Water, and C is the point of Incidence in which any Ray coming in the Air from A in the Line A C is reflected or refracted, and I would know whether this Ray shall go after Reflexion or Refraction: I erect upon the Surface of the Water from the point of Incidence the Perpendicular C P and produce it downwards to Q, and conclude by the first Axiom, that the Ray after Reflexion and Refraction, shall be found somewhere in the Plane of the Angle of Incidence A C P produced. I let fall therefore upon the Perpendicular C P the Sine of Incidence A D, and if the reflected Ray be desired, I produce A D to B so that D B be equal to A D, and draw C B. For this Line C B shall be the reflected Ray; the Angle of Reflexion B C P and its Sine B D being equal to the Angle and Sine of Incidence, as they ought to be by the second Axiom. But if the refracted Ray be desired, I produce A D to H, so that D H may be to A D as the Sine of Refraction to the Sine of Incidence, that is as 3 to 4; and about the Center C and in the Plane A C P with the Radius C A describing a Circle A B E I draw Parallel to the Perpendicular C P Q, the Line H E cutting the circumference in E, and joyning C E, this Line C E shall be the Line of the refracted Ray. For if E F be let fall perpendicularly on the Line P Q, this Line E F shall be the Sine of Refraction of the Ray C E, the Angle of Refraction being E C Q; and this Sine E F is equal to D H, and consequently in Proportion to the Sine of Incidence A D as 3 to 4.

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